Natural Resource Damage and Claims:
Potential Department of Defense Liabilities and Mitigation Opportunities

Technical Information Paper #33-001-0303

PURPOSE. To describe the Natural Resource Damage Assessment (NRDA) process, identify Department of Defense (DOD) roles and responsibilities, and propose approaches that may reduce the probability or consequences of claims directed at DOD. To promote an awareness of potential Natural Resource Damage (NRD) claim liabilities and methods that may be used to help reduce these claims.

REFERENCES. See Enclosure for a list of reference information.

POINTS OF MAJOR INTEREST AND FACTS.

INTRODUCTION

The NRDA provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, the Oil Pollution Act (OPA) of 1990, and the Clean Water Act (CWA) of 1972 designate Federal, state, Indian tribe, or international natural resource trustees to—

- Assess damages for injuries to natural resources.
- Recover costs of damages and assessments from responsible parties.
- Restore, replace, or acquire the equivalent of damaged resources and compensate for lost services.

Damages recovered from such claims can be substantial and may exceed cleanup costs. Natural resource trustees are pursuing NRD claims where DOD agencies are either responsible parties or co-trustees. A recent case at the Massachusetts Military Reservation demonstrates that state National Guard and DOD components are vulnerable to NRD claims. International NRD claims for extraterritorial natural resource damages are also possible. DOD natural resource and environmental professionals should be aware of NRD claim liabilities and proactive measures that can reduce the incidence or consequence of potential claims.

NATURAL RESOURCE DAMAGE ASSESSMENT

NRDA provisions in federal and/or state regulations allow natural resource trustees to assess injuries to natural resources from the release of hazardous substances or oil, calculate damages resulting from those injuries, recover the costs of damages and assessment from responsible parties, and restore or replace damaged resources and compensate for lost services.

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Natural resources are broadly defined to include land, fish, wildlife, biota, air, water (i.e., surface water and sediments), ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, or otherwise controlled by a government entity. Government entities include: the United States, any state or local government, any foreign government, any Indian tribe; or, if such resources are subject to a trust and restriction on alienation, any member of an Indian tribe. Responsible parties (RPs) are broadly defined to include the owner and/or operator of a facility or vessel involved in the containment or transportation of a hazardous substance, any person who disposes of a hazardous substance, or any person who arranges for disposal of a hazardous substance.

Federal trustees normally include the Department of Interior (DOI), represented by the U.S. Fish and Wildlife Service, and the Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA). Other Federal trustees include the Department of Agriculture, the DOD, and the Department of Energy. State trustees are those agencies designated by the governor of the state and are usually departments responsible for fish, game, and wildlife or environmental protection. Only designated state trustees can perform an assessment, which is entitled to the rebuttal presumption. Tribal officials designate Indian tribe trustees. Foreign trustees are designated by the head of any foreign government.

"Injury" is defined as a measurable adverse change in the chemical or physical quality and viability of a natural resource resulting either directly or indirectly from exposure to release of a hazardous substance, discharge of oil, or physical destruction of habitat. "Natural resource damages" are the monetary compensation sought by resource trustees to compensate for injuries. Recovered damages are used to restore, replace, or acquire the equivalent of the injured natural resources. Settlements for NRD claims can be significant and may exceed cleanup costs at some sites. To date, Federal authorities have settled over 70 cases for a total of over $200 million[1].

BASIS FOR NATURAL RESOURCE DAMAGE CLAIMS

Federal claims for NRDs are made under the provisions of CERCLA, OPA, and CWA. These statutes designate Federal or state officials, on behalf of the public, to execute their provisions. State trustees may also bring claims for NRDs under the provisions of state fish and game codes, civil codes, and/or various provisions of common law. Fish and game codes often include provisions for claims due to physical habitat injury due to mining, filling of a marsh, dredging, or alteration of stream or river channels.

This paper focuses primarily on procedures used to pursue claims under DOI[2] and NOAA[3] rules. States and Indian tribes may also pursue claims under these rules. Although some initial claims were made under CWA, most claims have been made under CERCLA provisions. OPA, which amended parts of the CWA, is not applied for oil spills. Claims such as those for coral reef damages due to vessel groundings in the Florida Keys may also be made for habitat injury under the National Marine Sanctuaries Act (NMSA). NMSA claims are limited to designated national sanctuaries.

International NRD claims for extraterritorial NRDs are also possible. A claim focused on damages related to Kuwait oil fires during the 1991 Gulf War has been submitted to the United National Compensation Commission. Several U.S. agencies, including the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) are claimants. The USACHPPM claim includes costs incurred as part of conducting a health risk assessment. Overseas, U.S. military installations and activities may be subject to future NRD claims made against DOD components.

The DOI and NOAA rules provide similar standardized procedure for pursuing NRD claims; they differ primarily in the defined assessment procedures. Trustees may elect not to follow these procedures, and they are seldom fully completed. However, following these procedures enables trustees to obtain a rebuttable presumption under CERCLA (section 107 (f)(2)(C) or OPA (section 1006(e)(2)). The procedures begin with the notification of or detection by the natural resource trustee of a release or discharge and generally include the following four phases:

- Pre-assessment
- Assessment planning
- Assessment
- Post-assessment

The pre-assessment phase includes notifying potential responsible parties (PRPs) and other trustees, collecting ephemeral data, implementing emergency response actions, and establishing protocols for coordination among trustees. During the pre-assessment screen, the trustees identify natural resources potentially at risk, exposure pathways to these resources, and services that have been lost. These determinations are generally based on existing information. To proceed to the assessment phase, the pre-assessment must find that the following conditions exist:

- A release sufficient to cause injury to trust natural resources has occurred.
- Data to pursue an assessment are available at a reasonable cost.
- Planned response actions are insufficient to remedy injury.

Based on these determinations, trustees jointly decide whether or not to conduct a damage assessment. The assessment planning phase involves screening available information, reaching a formal determination to proceed or not, selecting of the damage assessment procedure, identifying methodologies to be applied for the assessment, and developing an initial estimate of economic damages. This planning is implemented to ensure that the assessment is performed in an organized, coordinated, and cost-effective manner. CERCLA identifies two types of assessment approaches, and OPA identifies four types of approaches. The spectrum or approaches range from simple compensation models to comprehensive investigations; this broad range allows trustees to select a procedure appropriate to the case. Assessments may progress from simple to more comprehensive as additional information is required.

During assessment planning, trustees generally develop a preliminary estimate of the anticipated costs of restoration for injured natural resources and the compensable value. This is done to provide an order of magnitude estimate of economic damages, identify categories of injuries that need to be valued, and confirm that costs for the damage assessment are reasonable and justifiable.

The assessment phase includes the injury determination, injury quantification, and damage determination. During this phase, a restoration plan is developed and the value of lost services is calculated. Activities include completing the resource injury and economic damage or restoration cost reports, the presenting the claim to the PRPs, establishing a restoration account, and developing a detailed restoration plan.

The restoration planning process is normally conducted concurrently with the injury and damage assessment. It involves the development of a draft restoration plan, review of the plan, and preparation of a final plan. The draft plan is based on a review of injury assessment reports, restoration literature, and recommendations from trustees and outside investigators. It begins with the identification of candidate restoration options and the screening of these options to identify feasible and appropriate alternatives. The draft plan normally undergoes a technical review that often includes a group of outside technical peer reviewers, public meetings, and subsequent modification of the plan based on this input and the results of ongoing injury or feasibility studies. A final plan is prepared and approved by the designated resource trustees.

NATURAL RESOURCE DAMAGE MEASURES

DOI and NOAA rules hold responsible parties liable for two types of monetary recoveries: (1) costs of restoring injury natural resources; plus, (2) compensable losses incurred between the time of the release and full restoration of the resource. Damages recovered compensate for injury to, destruction of, or loss of natural resources resulting from release of a hazardous substance or oil discharge. These damages are residual or in addition to cleanup costs.

In the past, translating natural resource injuries into monetary values often involved controversial techniques such as contingent valuation methods using “willingness to pay” surveys. Restoration is now the current focus of NRDA actions, and this is reflected to the more recent OPA rules.[4] New approaches for scaling, such as habitat equivalency methods, are now being used to quantify the scope of required restoration and reflect a trend toward a more direct focus on using restoration costing as the basis of the claim.

RESTORATION

Funds obtained from responsible parties as a result of NRD settlements must be used to restore, replace, or acquire the equivalent of injured natural resources. Restoration includes direct attempts to return the injured resource to its baseline condition as measured in terms of the physical, chemical, and biological services previously provided by the injured resources.

Replacement provides a substitute for an injured resource and/or its services. Acquisition of equivalent resources provides for the purchase, trade, acquisition by other means, or protection of resources that are similar or related to the injured resource in terms of value, functions, or services provided. The clear preference is for on-site restoration unless the restoration cost is "grossly disproportionate" to the use value of the resource, restoration is not possible, or natural recovery will quickly return resources to baseline conditions.

The new focus on restoration as the measure of damages coupled with the cost of potential claims highlights the need for sound restoration planning. Restoration planning requires knowledge of baseline conditions, the nature and extent of the injuries to trustee resources, natural recovery rates of potentially impacted resources, and knowledge of alternative restoration methods and their cost and performance under conditions existing at the site.

The state-of-the art for some areas of natural resource restoration is now well established. Although a number of techniques have been developed and tested, many initial implementations have not met performance objectives or have not been adequately evaluated. Many methods were originally used for mitigation and include techniques for restoring or replacing injured habitat, replacing selected high-value resources, and acquiring or constructing alternate habitat.

Primary restoration includes methods to directly restore sediments or soils to levels of contamination that would not pose a risk to human or ecological receptors. Dredging and removing contaminated sediments or capping contaminated areas with clean fill are typical primary restoration approaches.

Habitat restoration includes rehabilitating impacted habitats, restoring other similar habitats within eco-region, or converting habitat from one type to another. Rehabilitating impacted habitats might include structural repairs to coral reefs or revegetating reverine corridors. Offsite restoration might include restoring riverine fish passages for migrating fish or cleaning gravel in spawning beds within a watershed. Habitat can be enhanced or modified to increase the carrying capacity for injured species at some sites. Submerged aquatic vegetation can be transplanted to restore structure and function to degraded habitats. New reef/hard bottom habitat areas might be built with constructed reef technology or by excavating to create new marsh habitat. Creating alternative offsite habitat is considered only where onsite remediation or rehabilitation is not possible or cost-effective.

Direct implementation of some injured species via reintroduction or supplementation of translocated animals or revegetation may be feasible. For example, a growing number of species can be cultured in hatcheries and stocked to replace injured stocks. However, this technology is currently limited and care must be taken not to adversely affect the genetic composition of target species or introduce disease problems. Translocation of organisms can also be used in conjunction with habitat enhancement; where practicable, this approach may be very cost-effective.

Methods also include changes in resource management practices designed to further protect those resources or speed their recovery. These might include protecting critical habitats to reduce the impact resulting from resource injuries. For example, controlling fishing pressure may reduce further risks to injured exploited stocks and allow them to recover.

DOD'S NRDA ROLES AND RESPONSIBILITIES

To support national security objectives, DOD must operate sustainable installations that allow adequate military training and testing while protecting and preserving the environment. The Secretary of Defense has trusteeship for about 25 million acres of land that include a wide variety of terrestrial and aquatic ecosystems with more than 220 endangered and rare species. Some DOD lands, due to limited access and local encroachment, have become "accidental preserves." Potential future NRD claims may include damages for injuries to resources that might not be present except for the habitat protection provided by the facility.

DOD components may be a resource trustee, PRP, or both depending on the specifics of a case. DOD components are natural resource trustees at active installations and may be involved in claims against contractors or other third parties. They may also be PRPs at active or former installations. In addition, they may be both trustees and PRPs on active installations, but in these cases, cannot serve as the lead trustee. DOD liabilities for natural resource injuries have not been estimated but may be substantial. The State of New Mexico recently included DOD and the Air Force in a claim for ground water contamination where damages have been valued at over 4 billion dollars; this claim was dismissed in Federal Court.

As a trustee, DOD has stewardship responsibility for natural resources on lands and waters where they have jurisdiction. DOD must, with certain exceptions, comply with environmental and natural resource regulations including the NRDA provisions incorporated within these regulations. DOD is responsible for identifying potential natural resource injuries on its facilities.

As a PRP, DOD components must address damage claims made against them. A recent case at the Massachusetts Military Reservation demonstrates that DOD facilities are vulnerable to NRD claims. In this case, the Air Force is in the role of both trustee and PRP. As state agencies become more familiar with the NRD process through participation as co-trustees in Federal claims, state claims against DOD may increase. Base Realignment and Closure (BRAC) actions, Formerly Used Defense Sites (FUDS), and problematic IRP sites are likely candidates for action. In addition, DOD may be drawn into NRD litigation as a result of claims directed at DOD contractors and facility tenants.

OPPORTUNITIES TO REDUCE THE RISK OR IMPACT OF NRD CLAIMS

AVOIDING CLAIMS

Establishing and maintaining good working relationships with the local community, stakeholders, and potential trustees may help avoid claims or reduce settlement costs. Claims may be initiated when the public or local entities become frustrated in efforts to address environmental problems. Although private citizens or municipalities may not bring direct claims, private citizens and groups have filed suit to compel designated Federal or state trustees to enter or expand other claims to include natural resource damages. Action to review the failure of a Federal official to perform a non-discretionary duty may be brought in the District Court by a person in the area in which the person resides or in which the damage to natural resources occurred.

Existing defenses for natural resource injury caused by permitted release provide opportunities for DOD to avoid future claims. CERCLA 107 (f)(1) shields an RP from liability if it is demonstrated that claimed damages were identified in an environmental impact statement or similar analysis as an irreversible and irretrievable loss of natural resources. An RP is also shielded if the decision to grant a permit or license authorized a commitment of natural resource and the permitted facility operated within the terms of its permit or license (Idaho vs. Hanna Mining Co., 882 F. 2d 393 (9th Cir. 1989)). These defenses apply only to newly permitted projects and do not eliminate liability for damages due to past activities. However, careful preparation and updating of environmental impact documents and permit or license applications, and ensuring compliance with permit limitations can reduce potential future liabilities.

Anticipatory thinking, rather than crash efforts after a claim is made, may also provide a means of avoiding potential claims or reducing their consequences. To the extent practicable, potential future claims sites should be anticipated and appropriate prevention and mitigation options implemented. By identifying specific sites as being at risk as soon as practical and prioritizing them for prompt preventative actions and improved contingency plans, claims may be avoided or reduced. Conducting NRD-focused audits and completing baseline environmental studies to establish current conditions at high-risk sites will support these efforts. Audit efforts could be readily incorporated into existing programs such as the Environmental Compliance and Assessment System. NRD claim issues should also be incorporated into Integrated Natural Resource Management Plans (INRMPs) and Environmental Management Systems. Establishing and preserving baseline data at potential future claim sites will help clarify prior conditions and provide a more accurate basis for potential injury determination. This approach may be especially useful when facilities are transferred, expanded, or acquired.

Anticipatory management should include prioritizing potential NRD sites by considering both hazard and exposure concerns. The first step is to locate installation sites that may be the source of a hazardous release or discharge due to their past or present operations, and then assess the probability and consequence of a release or spill. The second step is to inventory potential

natural resources at risk, such as endangered species, critical habitats, and drinking water supplies. A potential damage estimate can then be made based on the cost of restoring, replacing, or acquiring the equivalent of those resources. Potential liabilities can be predicted by combining information on potential release or spill scenarios, fate and transport pathways, and injuries to impacted resources. A Geographic Information System (GIS) could be used to help integrate this information and estimate potential damages. Sites can then be prioritized based on potential damages. For example, this exercise might suggest that certain operations or activities over sole source aquifiers should be addressed immediately. Cost-effective contingency plans and corrective measure can be developed to avoid or reduce the potential for substantial injuries.

REDUCING THE COST OF NRD CLAIMS

Even when a claim is made, steps can still be taken to reduce overall liabilities. Timely proactive measures can help lower thecost of NRD claims. To the extent possible, active participation in the injury assessment, restoration cost analyses, and restoration planning may provide opportunities to control costs. When possible, DOD components should be knowledgeable and active participants in the assessment and restoration process.

Identifying potential NRD claims as soon as possible helps provide adequate time to prepare an effective strategy. Trustees are required to send a Notice of Intent to perform an assessment to all identified PRPs and to invite PRPs to participate in developing the type and scope of assessment. DOD should quickly and carefully review these notifications and proposed assessment within the 30-day response period to allow appropriate active participation. Where applicable, DOD should use its trustee standing to actively participate in the NRDA process. In the case of facilities slated for closure through BRAC, it may benefit DOD to initiate action while they are still co-trustees rather than wait until they lose this status. If the process becomes conflicted, an informal parallel injury/damage assessment can be conducted in order to challenge controversial assessments or the apportionment of damages between defendants.

Seeking opportunities for cooperative assessments or negotiated settlements of NRD enforcement actions provides potentially significant advantages. Both options allow greater input into decision making.

Cooperative assessments are based on agreements between trustees and responsible parties to conduct a coordinated injury investigation[5]. Cooperative assessments can benefit all parties and lead to faster restoration of injury resources.

Negotiated settlements may result in more cost-effective restoration, reduce assessment costs, and allow responsible parties to merge settlement negotiations with remedial action negotiations. By merging claims into a single negotiation, NRD claims may be placed in a subordinate role and settlement costs minimized. This would also allow RPs to incorporate selected restoration measures into remedial response, thereby reducing costs. Under Section 122(j)(2) of CERCLA, a consent decree resolving liability for a remedial action may include a covenant not to sue for

NRDs if the Federal trustees agree to the covenant in writing. The Federal trustee may agree to such a covenant "if the responsible party agrees to undertake appropriate actions necessary to protect and restore NRDs by the release at issue."

Expediting the process is also important to reduce costs. This approach is consistent with emerging Army policy[6] aimed at promoting earlier and more complete consideration of injuries or risks to natural resources. The NRDA/restoration process can be expedited by using existing data to assess potential injuries, using restoration costs instead of damages as the claim basis, and integrating restoration and service replacement efforts into the remediation process. Injury assessments can utilize data from ecological risk assessments and INRMPS for preliminary analyses. Using restoration analysis to establish the claim basis and applying new approaches such as "habitat equivalency analysis"[7] may help reduce the need for expensive economic studies[8]. Expediting restoration by seeking projects that concurrently restore resources and their lost use may be an effective strategy to contain costs. In some cases, independent and prompt action prior to settlement to provide substitute services, such as recreational opportunities, may be effective measures to reduce damage claims. DOD policy incorporates the integration of natural resource injury responsibilities and environmental restoration actions.

IMPROVING RESTORATION

Restoration is often the most significant component of a damage claim. Improving restoration planning and implementation can provide significant return on investment. The decision-making process involved in selecting and scaling restoration projects largely determines the cost of this element of a claim. Since settlements are likely to include clauses that allow cases to be reopened after cleanup of a site if latent flaws are detected, assuring the performance of remediation and restoration can minimize future liability. Active participation in restoration planning is critical to the selection of feasible and cost-effective projects.

A systematic approach is needed to ensure that restoration plans result in the selection of cost-effective projects that are relevant to the claimed injuries. Restoration planning can be enhanced by expediting and improving the decision-making process which is used to identify, select, and scale appropriate methods. It is critical that the planning effort focus on well-defined objectives and consider site-specific conditions as well as the uncertainty inherent in proposed techniques.

The goal of restoration is to ensure that the implemented actions make the public whole for the resources lost due to the release or spill. The planning process should use the nature and extent of injury to develop clear restoration objectives and post-implementation monitoring criteria to evaluate performance. The injury studies and baseline or reference site studied form the basis of information used to support the development of restoration requirements. These requirements are used to generate alternative restoration methods. The alternatives are then evaluated to aid trustee decision makers to select the most cost-effective methods and scale the proposed effort to meet the requirements. NEPA compliance is often required for plan implementation.

Problems occur when restoration methods are identified before clear objectives and performance criteria are clearly articulated and agreed to by all participating trustees and stakeholders. This may lead to the selection of methods for damage recovery that are never implemented due to public opposition or other constraints. Guidance in the Federal rules identify factors that should be considered but do not establish how tradeoffs between factors are to be made. These issues are left to the trustees, and one of the common claims made by RPs is that the selection of restoration methods was arbitrary and capricious.

Federal rules specify that trustees identify a "reasonable range" of restoration alternatives. These must include choosing a "no action" alternative, or allowing natural recovery with a minimum of management activities. Unlike the damage assessment parts of the rules, the restoration guidance is not as detailed, and trustees may apply different weights to the factors considered[9]. Both Federal rules identify several factors that suggest three objectives—

- Net expected benefit (considering all collateral issues).
- Cost.
- Acceptability of consistency (including concerns over legal and policy consistency, relationship to injury, and public, stakeholder, and responsible party concerns).

Evaluation of alternative approaches should consider the selection factors identified in the DOI and NOAA rules and also consider stakeholder concerns, which can influence whether or not the projects will be implemented.

Restoration performance is subject to considerable uncertainty, which needs to be explicitly considered in the selection of alternatives. Innovative methods may prove to be cost-effective but need to be tested and evaluated prior to full-scale implementation. Feasibility studies, parallel testing efforts, or phased implementation should be considered when performance is uncertain due to technology or weather condition. Post-implementation monitoring may be required to allow for adaptive management and final scaling of restoration projects.

The implementation methods will determine the cost and success of the restoration program. Selection of restoration options is often a complex decision based on multiple criteria and is subject to uncertainty. In many cases, multiple trustees and stakeholders are involved. Technical, economic, and legal factors assessed using different metrics must be incorporated into the decision-making process. Decision analysis methods that help structure and document the selection process are useful for integrating multiple incommensurate factors and explicitly evaluating uncertainty[10]. These methods have been used with a number of cases to provide insights that enhanced trustee decision making and reduced potential implementation delays. If a decision-analysis approach is used to select the preferred alternatives, NEPA documents can be readily tiered on these analyses.

CONCLUSIONS

The NRDA regulations authorize natural resource trustees to bring claims against PRPs to recover damages for natural resources injured by the release of hazardous substances or oil. DOD components have responsibilities as resource trustees on active installations or ranges. DOD may also be an RP when other natural resource trustees are pursuing NRD claims where DOD components are identified as PRPs.

Damages recovered from such claims can be substantial since an NRD claim under the Federal rules is a statutory cause of action, not necessarily constrained by common law precedents. While the full impact NRD claims on DOD is not clear, base closure actions and delayed IRP activities, as well as spills, may trigger in future claims. These claims may include extraterritorial claims for overseas installations or activities.

An awareness of NRDA issues, resulting potential liabilities, emerging trends in case practice, and the restoration planning process can be integrated into ongoing risk assessments, environmental auditing, spill contingency planning, IRP, or base-closure planning. Proactive measures, including early evaluation of potential claims, cooperative assessments, negotiated settlements, and improved restoration planning can help avoid, reduce, and control potential liabilities.

PREPARED BY: Daniel J. Sheehy and Susan F. Vik*

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*Daniel J. Sheehy, Ph.D,. is Senior Scientist and President of Aquabio, Inc., 350 Massachusetts Avenue, #142, Arlington, MA 02476. Susan F. Vik, PhD., is a strategic planner and Vice President of Aquabio, Inc. Part of this work was derived from a paper written by LTC Sheehy as a reservist assigned to the U.S. Army Center for Health Promotion and Preventive Medicine.

ENCLOSURE

REFERENCES

[1]Superfund: Outlook for and Experience with Natural Resource Damage Settlement. 1996. GAO/RCED-76-71. Government Accounting Office, U.S. Government Printing Office, Washington, D.C.

[2]U.S. Code of Federal Regulations (CFR) 1997, 43 CFR Part 11.

[3]U.S. Code of Federal Regulations 1997, 15 CFR Part 990.

[4]Wickham, D.A., C.C. Kahl. Mayer, and E. Reinharz. Restoration: 1993. The Goal of the Oil Spill Act Natural Resource Damage Actions. Baylor Law Review 45 (2):405-421.

[5]Cecil, G.R and C.R. O'Connor. 1993. Cooperative Natural Resource Damage Assessment Plans: A New Imperative. Natural Resources and the Environment, Fall 1993: 44-46.

[6]Interim Policy on Integration of Natural Resource Injury Responsibilities and Environmental Restoration Activities. May 2, 2000. Deputy Under Secretary of Defense (Environmental Security).

[7]Damage Assessment and Restoration Program, 1995. Habitat Equivalency Analysis; Policy and Technical Paper Series No. 95-1. NOAA, U.S. Government Printing Office, Washington, D.C.

[8]Carlucci, J. 1999. Natural Resource Damages at Contaminated Sites. Natural Resources and the Environment, Winter 1999. 473-477.

[9]Mazzotta, M.J., J.J. Opaluch, and T.A. Grigalunas. 1994. Natural Resource Damage Assessment: The Role of Resource Restoration. Natural Resources Journal, Winter 34: 153-77.

[10]Sheehy, D.J., C.P. Martz, M.C. Stopher, S.M. Turek, J.W. Miller, and J.P. Milton, 2000. Restoration Planning for the Cantara Metam Sodium Spill: A Group Multiattribute Decision Analysis Approach. Calif. Fish & Game 86(1): 72-86.